

**DUAL HEAD PUMP DRIVEN FILTRATION SYSTEM****ABSTRACT OF THE DISCLOSURE**

Improvements in product water throughput from a reverse osmosis (RO) membrane  
5 achieved by thinner feed spacers in the RO element (22), enhanced recovery (ratio of permeate  
to feed), pressure recovery of the retentate fluid pressure opposing the feed water pressure, and  
fluid pulsing of the RO element feed stream. These features are preferably combined to optimize  
the performance and cost per unit volume of water produced. The system of the invention  
preferably comprises a dual head reciprocating pump (20), an RO element (22) with a housing,  
10 and a differential pressure activated ("DPA") valve (24). The DPA valve (24), in combination with  
offsetting fluid pressures on the two pump heads (28, 30), generate energy recovery. The  
frequency and amplitude of the reciprocating pump (20) create a pulse wave in the RO  
element (22) that improves permeate quality and throughput. A control system preferably  
monitors system parameters to optimize the reciprocating pump (20) speed and amplitude to tune  
15 the optimal frequency and amplitude required for maximum throughput and permeate quality from  
any given RO element (22) configuration.